$a_1(1260)$

$I^G(J^{PC}) = 1^-(1^{++})$

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$a_1(1260)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
1230±40 OUR ESTIMATE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1331±10± 3	37k	[1] ASNER	00	CLE2		10.6 $e^+e^- \to \tau^+\tau^-, \tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
1255± 7± 6	5904	[2] ABREU	98G	DLPH		e^+e^-
1207± 5± 8	5904	[3] ABREU	98G	DLPH		e^+e^-
1196± 4± 5	5904	[4,5] ABREU	98G	DLPH		e^+e^-
1240±10		BARBERIS	98B			450 $pp \to p_f\pi^+\pi^-\pi^0 p_s$
1262± 9± 7		[2,6] ACKERSTAFF	97R	OPAL		E_{cm}^{ee}= 88–94, $\tau \to 3\pi\nu$
1210± 7± 2		[3,6] ACKERSTAFF	97R	OPAL		E_{cm}^{ee}= 88–94, $\tau \to 3\pi\nu$
$1211\pm 7^{+50}_{-\ 0}$		[3] ALBRECHT	93C	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1121± 8		[7] ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
1242±37		[8] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1260±14		[9] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1250± 9		[10] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1208±15		ARMSTRONG	90	OMEG	0	300.0$pp \to pp\pi^+\pi^-\pi^0$
1220±15		[11] ISGUR	89	RVUE		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1260±25		[12] BOWLER	88	RVUE		
1166±18±11		BAND	87	MAC		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1164±41±23		BAND	87	MAC		$\tau^+ \to \pi^+\pi^0\pi^0\nu$
1250±40		[11] TORNQVIST	87	RVUE		
1046±11		ALBRECHT	86B	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1056±20±15		RUCKSTUHL	86	DLCO		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1194±14±10		SCHMIDKE	86	MRK2		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1255±23		BELLINI	85	SPEC		40 $\pi^- A \to \pi^-\pi^+\pi^- A$
1240±80		[13] DANKOWY...	81	SPEC	0	8.45 $\pi^- p \to n3\pi$
1280±30		[13] DAUM	81B	CNTR		63,94 $\pi^- p \to p3\pi$
1041±13		[14] GAVILLET	77	HBC	+	4.2 $K^- p \to \Sigma 3\pi$

[1] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.

[2] Uses the model of KUHN 90.
[3] Uses the model of ISGUR 89.
[4] Includes the effect of a possible a_1' state.
[5] Uses the model of FEINDT 90.
[6] Supersedes AKERS 95P
[7] Average and spread of values using 2 variants of the model of BOWLER 75.
[8] Reanalysis of RUCKSTUHL 86.
[9] Reanalysis of SCHMIDKE 86.
[10] Reanalysis of ALBRECHT 86B.
[11] From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
[12] From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
[13] Uses the model of BOWLER 75.
[14] Produced in K^- backward scattering.

$a_1(1260)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
250 to 600 OUR ESTIMATE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$814 \pm 36 \pm 13$	37k	[15] ASNER	00	CLE2		10.6 $e^+e^- \to \tau^+\tau^-, \tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
450 ± 50	22k	[16] AKHMETSHIN	99E	CMD2		1.05–1.38 $e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
570 ± 10		[17] BONDAR	99	RVUE		$e^+e^- \to 4\pi$, $\tau \to 3\pi\nu_\tau$
$587 \pm 27 \pm 21$	5904	[18] ABREU	98G	DLPH		e^+e^-
$478 \pm 3 \pm 15$	5904	[19] ABREU	98G	DLPH		e^+e^-
$425 \pm 14 \pm 8$	5904	[20,21] ABREU	98G	DLPH		e^+e^-
400 ± 35		BARBERIS	98B			450 $pp \to p_f\pi^+\pi^-\pi^0 p_s$
$621 \pm 32 \pm 58$		[18,22] ACKERSTAFF	97R	OPAL		E_{cm}^{ee}= 88–94, $\tau \to 3\pi\nu$
$457 \pm 15 \pm 17$		[19,22] ACKERSTAFF	97R	OPAL		E_{cm}^{ee}= 88–94, $\tau \to 3\pi\nu$
$446 \pm 21 \,^{+140}_{-0}$		[19] ALBRECHT	93C	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
239 ± 11		ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
$266 \pm 13 \pm 4$		[23] ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
$465 \,^{+228}_{-143}$		[24] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
$298 \,^{+40}_{-34}$		[25] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$

488 ± 32	[26] IVANOV	91	RVUE		$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$
430 ± 50	ARMSTRONG	90	OMEG	0	$300.0 p p \rightarrow p p \pi^+ \pi^- \pi^0$
420 ± 40	[27] ISGUR	89	RVUE		$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
396 ± 43	[28] BOWLER	88	RVUE		
$405 \pm 75 \pm 25$	BAND	87	MAC		$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
$419 \pm 108 \pm 57$	BAND	87	MAC		$\tau^+ \rightarrow \pi^+ \pi^0 \pi^0 \nu$
521 ± 27	ALBRECHT	86B	ARG		$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
$476 {}^{+132}_{-120} \pm 54$	RUCKSTUHL	86	DLCO		$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
$462 \pm 56 \pm 30$	SCHMIDKE	86	MRK2		$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
292 ± 40	BELLINI	85	SPEC		$40\ \pi^- A \rightarrow \pi^- \pi^+ \pi^- A$
380 ± 100	[29] DANKOWY...	81	SPEC	0	$8.45\ \pi^- p \rightarrow n 3\pi$
300 ± 50	[29] DAUM	81B	CNTR		$63,94\ \pi^- p \rightarrow p 3\pi$
230 ± 50	[30] GAVILLET	77	HBC	+	$4.2\ K^- p \rightarrow \Sigma 3\pi$

[15] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.
[16] Using the $a_1(1260)$ mass of 1230 MeV.
[17] From AKHMETSHIN 99E and ASNER 00 data using the $a_1(1260)$ mass of 1230 MeV.
[18] Uses the model of KUHN 90.
[19] Uses the model of ISGUR 89.
[20] Includes the effect of a possible a_1' state.
[21] Uses the model of FEINDT 90.
[22] Supersedes AKERS 95P
[23] Average and spread of values using 2 variants of the model of BOWLER 75.
[24] Reanalysis of RUCKSTUHL 86.
[25] Reanalysis of SCHMIDKE 86.
[26] Reanalysis of ALBRECHT 86B.
[27] From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
[28] From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
[29] Uses the model of BOWLER 75.
[30] Produced in K^- backward scattering.

$a_1(1260)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$(\rho\pi)_{S-\text{wave}}$	seen
Γ_2	$(\rho\pi)_{D-\text{wave}}$	seen
Γ_3	$(\rho(1450)\pi)_{S-\text{wave}}$	seen
Γ_4	$(\rho(1450)\pi)_{D-\text{wave}}$	seen
Γ_5	$\sigma\pi$	seen

Γ_6	$f_0(980)\pi$	not seen
Γ_7	$f_0(1370)\pi$	seen
Γ_8	$f_2(1270)\pi$	seen
Γ_9	$K\overline{K}^*(892)+$c.c.	seen
Γ_{10}	$\pi(1300)\pi$	not seen
Γ_{11}	$\pi\gamma$	seen

$a_1(1260)$ PARTIAL WIDTHS

$\Gamma(\pi\gamma)$ Γ_{11}

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
640±246	ZIELINSKI	84C	SPEC	200 π^+ Z → Z3π

D-wave/S-wave AMPLITUDE RATIO IN DECAY OF $a_1(1260) \to \rho\pi$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.107±0.016 OUR AVERAGE				
−0.10 ±0.02 ±0.02	[31,32] ACKERSTAFF	97R	OPAL	$E_{\rm cm}^{ee}$= 88–94, $\tau \to 3\pi\nu$
−0.11 ±0.02	[31] ALBRECHT	93C	ARG	$\tau^+ \to \pi^+\pi^+\pi^-\nu$

[31] Uses the model of ISGUR 89.
[32] Supersedes AKERS 95P.

$a_1(1260)$ BRANCHING RATIOS

$\Gamma((\rho\pi)_{S-\text{wave}})/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
68.11	37k	[34] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho\pi)_{D-\text{wave}})/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.36±0.17±0.06	37k	[34] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho(1450)\pi)_{S-\text{wave}})/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.30±0.64±0.17	37k	[34,35] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho(1450)\pi)_{D-\text{wave}})/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.43±0.28±0.06	37k	[34,35] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(\sigma\pi)/\Gamma_{total}$ Γ_5/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$16.18 \pm 3.85 \pm 1.28$	37k	[34,36] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_0(980)\pi)/\Gamma_{total}$ Γ_6/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen	37k	ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_0(1370)\pi)/\Gamma_{total}$ Γ_7/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$4.29 \pm 2.29 \pm 0.73$	37k	[34,37] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_2(1270)\pi)/\Gamma_{total}$ Γ_8/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.14 \pm 0.06 \pm 0.02$	37k	[34,38] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma_{total}$ Γ_9/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.3 \pm 0.5 \pm 0.1$	37k	[39] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(\pi(1300)\pi)/\Gamma_{total}$ Γ_{10}/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.01	90	37k	[40,41] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
<0.019	90	37k	[40,42] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(\sigma\pi)/\Gamma((\rho\pi)_{S\text{-wave}})$ Γ_5/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.3	28k	AKHMETSHIN	99E	CMD2	1.05–1.38 $e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
0.003 ± 0.003		[33] LONGACRE	82	RVUE	

[33] Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from GAVILLET 77, DAUM 80, and DANKOWYCH 81.

[34] From a fit to the Dalitz plot.
[35] Assuming for $\rho(1450)$ mass and width of 1370 and 386 MeV respectively.
[36] Assuming for σ mass and width of 860 and 880 MeV respectively.
[37] Assuming for $f_0(1370)$ mass and width of 1186 and 350 MeV respectively.
[38] Assuming for $f_2(1270)$ mass and width of 1275 and 185 MeV respectively.
[39] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.
[40] Assuming for $\pi(1300)$ mass and width of 1300 and 400 MeV respectively. From a fit to the Dalitz plot.
[41] Assuming $\pi(1300) \rightarrow \rho\pi$ decay.
[42] Assuming $\pi(1300) \rightarrow \sigma\pi$ decay.

$a_1(1260)$ REFERENCES

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AKHMETSHIN	99E	PL B466 392	R.R. Akhmetshin *et al.*	(CMD-2 Collab.)
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ACKERSTAFF	97R	ZPHY C75 593	K. Ackerstaff *et al.*	(OPAL Collab.)
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ANDO	92	PL B291 496	A. Ando *et al.*	(KEK, KYOT, NIRS, SAGA+)
IVANOV	91	ZPHY C49 563	Y.P. Ivanov, A.A. Osipov, M.K. Volkov	(JINR)
ARMSTRONG	90	ZPHY C48 213	T.A. Armstrong, M. Benayoun, W. Beusch	
FEINDT	90	ZPHY C48 681	M. Feindt	(HAMB)
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ISGUR	89	PR D39 1357	N. Isgur, C. Morningstar, C. Reader	(TNTO)
BOWLER	88	PL B209 99	M.G. Bowler	(OXF)
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GAVILLET	77	PL 69B 119	P. Gavillet *et al.*	(AMST, CERN, NIJM+) JP
BOWLER	75	NP B97 227	M.G. Bowler *et al.*	(OXFTP, DARE)

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